Executive Summary

The Economic Impact of Secondary and Post-Secondary Career and Technical Education in Tennessee

Prepared for:
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Tennessee Career and Technical Education Council, and
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The Economic Impact of Secondary and Post-Secondary Career and Technical Education in Tennessee

The purpose of this project was to examine the economic impact of secondary and post-secondary career and technical education on the individual and on the economy of the state of Tennessee. This study was designed to provide simple and straightforward answers to a common set of questions frequently asked by policymakers, state legislatures, local boards of education, and other governing bodies about secondary and post-secondary career and technical education:

1. How many people get jobs?
2. What are the jobs?
3. How much do they get paid?
4. How important are these jobs and their earnings to the state?
5. What is the public's return on their investment, and;
6. What is the impact of secondary and post-secondary career and technical education articulation and dual enrollment on the individual and the state?

Introduction

By almost any measure, career, technical, and vocational education is big business for the United States and for the state of Tennessee. With millions of high school and post-secondary students enrolled in and graduating from vocational, technical, and career programs each year, it is clearly a mainstay of the modern economy. In 2005, the U. S. government allocated nearly $2 billion to vocational and adult education. Consider that the nation employs over 200,000 instructors in vocational, technical, and career education generating over $10 billion in salaries annually.

In Tennessee alone over 300,000 students were enrolled in vocational, technical, and career programs in latest measurement period. Tennessee, with the forth highest concentration of vocational and technical educators in the na-

tion, employs over 6000 instructors generating more than $225 million in salaries each year. In the 2001-2002 school year the Perkins Act allocated over $24 million dollars in federal funds to Tennessee.

Students Enrolled in Career, Technical, and Vocational Education

- In 2000, the National Center for Education Statistics (NCES) reported that by 1994, 25 percent of all high school students were considered vocational concentrators (NCES, 2000, p. viii).
- 37.6 percent of all degree-seeking undergraduates were enrolled in vocational career education for the 1999-2000 school year. (NCES, 2004, p.1).
- In 2004, 602,000 people between the ages of 15 and 24 had attained an occupation associate's degree and 625,000 had attained an academic associate's degree (U.S. Census Bureau).
- In the 2000-2001 school year, 299,175 high school students in Tennessee were enrolled in (secondary) vocational education (TCOVE, Biennial Report, 2001-2002, p.7).
- In 2001-2002 there were 32,565 students enrolled in post-secondary vocational education (TBR Institutions) in Tennessee (TCOVE, Biennial Report, 2001-2002, p.8).

Instructors Employed in Career, Technical, and Vocational Education

- An estimated 102,210 people in the U.S. listed their occupation as secondary vocational education teachers in 2004. Their estimated average yearly income is $48,000 (U.S. Department of Labor, Bureau of Statistics).
- An estimated 112,990 people in the U.S. listed their occupation as post-secondary vocational education teachers in 2004. Their esti-

mated average yearly income is $44,060 (U.S. Department of Labor, Bureau of Statistics).

- An estimated 4,020 people in the state of Tennessee list their occupation as secondary vocational education teachers in 2004. The estimated average yearly income is $37,230 (U.S. Department of Labor, Bureau of Statistics).
- An estimated 2,030 people in the state of Tennessee listed their occupation as post-secondary vocational education teachers in 2004. Their estimated average yearly income is $37,190 (U.S. Department of Labor, Bureau of Statistics).
- Tennessee had the fourth highest concentration of workers in secondary vocational and technical education in the United States in 2004 (U.S. Department of Labor, Bureau of Statistics).

Expenditures in Career, Technical, and Vocational Education

- In the 2005 fiscal year, the Federal government spent $1,975,000,000 on "vocational and adult education" (Budget of the United States Government, 2005).
- Through the Perkins Act 1998, The Federal government allocated $2,233,311 to Tech-prep education in Tennessee for the 2001-2002 fiscal year (TCOVE, Biennial Report, 2001-2002, p.5).

The Career, Technical, and Vocational Education System in Tennessee

In March 2003, the U.S. Department of Education, Office of Vocational and Adult Education released a policy and practice brief detailing *The Economic Imperative for Improving Education*. This document—an appeal for the nation to prepare its students for new global and technological market challenges—acknowledged that, "In a world where fiscal capital and technology flow freely from country to country, a nation's human capital—the knowledge and skills

of its workforce—is the key to its well being" (U.S. Department of Education, 2003). The report notes the familiar examples of American companies shifting production locations as well as capital and technology overseas to areas with necessary skills and education, but with a standard of living and wages that would be unacceptably low in the United States.

Tennessee has moved aggressively into the global competition through advanced technology symbolized by electronics, chemical production, and automobile manufacturing with a state blue ribbon group called the Governor's Jobs Cabinet spearheading promotional efforts to reach investors and industrialists throughout the United States and across the globe. Career and technical education are key elements in that competitive environment and play a crucial role in the economic development of the state in the global marketplace. Graduates from these programs become part of the highly educated and skilled regional workforce needed to attract these enterprises to Tennessee,

The career and technical education system is composed of three types of educational institutions: secondary schools, technology centers, and community colleges. These institutions each form their own unique system, but all share the same goal of providing educational resources to students.

Secondary schools make up the earliest part of the post-secondary career and technical education system. Many secondary schools (typically high schools) provide educational opportunities for students wishing to take vocational or technical courses. These courses are designed to prepare students for entering the workforce after high school or to prepare them for continuing their education at a community college or technical center. There are 342 secondary schools in Tennessee that offer career and technical education. Courses provided by secondary schools are divided into the following program areas:

- Agriculture Education
- Business Technology
- Contextual Academics
- Family and Consumer Sciences Education
- Health Science Education
- Marketing Education

- Technology Engineering Education
- Trade and Industry Education

Over 100 different courses are offered in Tennessee secondary schools. Across the state, secondary schools provide almost 10,000 courses to Tennessee residents annually.

Technology Centers provide occupational and technical training to residents in their service area. These residents may be students, prospective employees, or current employees seeking additional training. Twenty-seven Tennessee technology centers provide services to residents across the state. Programs vary from center to center but may include teacher education, automotive repair, computer technology, electronics and healthcare. In all, there are 55 types of programs of study available to students at Tennessee technology centers.

Community Colleges/Technical Institutes are two-year institutions that offer certificate and associate degree programs. These institutions strive to provide students with a quality education that will enable them to seek employment upon graduation. In all areas of Tennessee, there are community colleges nearby that offer vocational-technical training. Across the state of Tennessee, there are 14 community colleges which offer a wide variety of vocational-technical programs such as: Workforce Prep/Retraining; Quality and Productivity Technology; Management Supervisory Training; Computer Information Technology; Manufacturing Systems Technology; Health Care; Tourism; Environmental Technology and Safety; and Custom Training.

The Tennessee Department of Labor and Workforce Development Career Center System

The Tennessee Department of Labor and Workforce Development established a Career Center System in 2000 designed with input from businesses and private industries across the state with a mission to connect people with jobs through a variety of employment-related support services that provide career information online and at over 80 local and satellite Career Centers across the state. The goal of the Career Center network is to maximize local accessibility to

workforce needs in one convenient location. These Career Centers are located in 13 local workforce investment areas across the state.

Occupational Outlook and Earnings for Career and Technical Education Graduates in Tennessee

According to the *Monthly Labor Review*, 25.4 percent of Tennessee's civilian labor force 25 years or older in 2003, had completed some college or an associate degree compared to the nation's 27.4 percent (Krolik, 2004). The unemployment rate for this cohort in the labor force is 5.5 percent in Tennessee and 4.8 percent nationally. *The Occupational Outlook Quarterly* for Fall 2003, states that full-time workers with an associate degree across the nation had median weekly earnings of $672 with an unemployment rate of 4 percent. The national average in 2003 for all full-time workers was $662 with an unemployment rate of 4.8 percent.

An advantage to any employer who hires a worker who is a secondary CTE graduate or who has an associate degree or post-secondary training—compared to a worker with only a high school diploma—is that secondary graduates, and associate degree and post-secondary training job applicants have received practical and job specific training and education. This training and education gives the job applicant specific job knowledge that will help him or her adapt quickly to the job for which they trained. Increased chances for early job responsibility may also come to the job applicant because he or she has shown their commitment to the occupation by earning their degree and learning the skills necessary for the job. The Tennessee Higher Education Commission (THEC), Department of Policy, Planning, and Research reports that in the 2002-2003 school year, a total of 6,346 associate degrees were awarded by two and four-year schools. For the 2002-2003 school year, 2,783 associate degrees were awarded in liberal studies, 1,173 in health, and 1,126 in business.

The job placement rate for Tennessee Community Colleges is promising. A majority of graduates receive jobs immediately after graduation. The 2003-04 average statewide job placement rate of Tennessee community college graduates was 91 percent (THEC, 2004). Since 1997, the job placement rates of community college graduates in Tennessee have not been below 89 percent. In 2003,

THEC reported that enrollment in public community colleges increased by 1.2 percent over 2002 to reach 75,264 students.

High School Completion Rates: Tennessee Trends and National, Regional and State Comparisons

From 1993-2000, Tennessee's mean dropout rate was 4.8 which rivaled the nation's average rate of 4.7. However, extensive reporting on dropout rates does not depict the complete picture of the educational situation in Tennessee. High school completion rates remain an important alternate focus for many policymakers and business leaders across the state.

Tennessee's high school completion rates are comparable to the rest of the nation. During the 2000-2001 year, Tennessee's completion rate was 79.5, only a percentage point lower than nation's estimated completion rate of 80.5. Over a five-year period from 1996-2001, Tennessee's mean rank was 20.6 relative to other states' completion rate ranks. From 1994-2001, Tennessee's mean completion rate was 79.7. Overall, Tennessee ranks near the middle when compared to the nation and when compared to other Southern states. Although Tennessee's completion rate confirms its relatively low dropout rate, completion rates have shown steady improvement over the last few years.

Dual Enrollment

Dual enrollment programs offer high school students the opportunity to take college courses and earn college credit, sometimes as early as the student's freshman year. Also known as concurrent enrollment, this arrangement allows students to be dually enrolled in high school and at a local post-secondary institution.

Each year an estimated 2 million students take advantage of dual credit and dual enrollment programs (Plucker, 2006). For participating students, regular tuition is required to enroll and earn credit hours and as of September 2005, 33 of the 40 states that have dual enrollment policy address tuition payment.

Ten of these states require the student to pay in full, seven states allow the post-secondary institution to choose how costs will be covered, ten require the institution itself to pay, and six states cover all tuition costs for dual enrollment students (U.S. Department of Education , 2005).

While tuition may be a heavier burden in some states, the advantages of dual enrollment for students, families, and taxpayers far exceed program costs. Many students also have an advantage given dual enrollment allows the student and his or her family to begin college admissions and financial paperwork in advance. In turn, the student creates a smoother transition between secondary and post-secondary enrollment.

If dual enrollment courses encourage students to remain in school, perhaps the most beneficial long-term outcome of the program is salary potential. In 2005, the average yearly income for a high school educated employee was $34,931; a worker with a bachelor's degree earned nearly 76 percent more with an average income of $61,368 (Plucker, 2006). This acceleration benefits both the individual and the state economy.

Finally, a student that earns dual enrollment credit will have the opportunity to graduate from a post-secondary institution in less time than his or her peers. According to the USDOE, the average time-to-degree for students that did not earn college credits prior to high school graduation was 4.65 years compared to those that earned nine or more credits with an average of 4.25 years (Adelman, 2004). Less time in college means fewer costs in tuition, fees, room and board, and supplies for students and families and earlier annual salaries.

Beyond the classroom and at home, dual enrollment also benefits taxpayers and local governments that support these programs. Minnesota, the first state to offer dual enrollment, reported that in 2001 families in Minnesota saved $11 million, while the state reduced expenses by almost $32 million through the Postsecondary Enrollment Options (PSEO) program (Colorado, 2006).

With increased education and a quicker time-to-degree, states save on expenses and also increase levels of workforce productivity, thereby increasing the wealth of the state, the U.S. and its citizens. Taxpayer dollars that support secondary and post-secondary systems earn more value for the money as students spend less time in school and enter the workforce with more experience than would be available without concurrent enrollment.

Following a simulation model, Tennessee high schools' full Average Daily Attendance (ADA) funding would remain for students taking less than half their coursework in a post-secondary institution during the junior year. In the senior year, students could take more than half their coursework in a post-secondary institution. As demonstrated in the model, if 10 courses or one-half of a 20 course Associate's degree are completed during the junior and senior year, dual enrollment students may cut up to one year from time to Associate's degree if they begin earning post-secondary credit during high school.

Economic Returns from Secondary and Post-Secondary Career and Technical Education

The relationship between education and employment and earnings has been well documented (Becker, 1964; Jencks, 1979; Stallman, 1991; Raudenbush and Kasim, 1998; Grubb, 1999). Studies over the past several decades have presented the same bleak economic and employment outlook for high school dropouts while showing bright earnings and job forecasts for each successive educational gain. Annual government reports and national education status reports confirm repeatedly substantial earnings and labor market prospects for high school, career and technical, two-year, and college graduates as well as for post- baccalaureate studies . The pattern of strong labor market attachments and substantially higher earnings for graduates and college educated individuals is consistent, constant, and almost perfectly correlated.

Human capital investments in education and in skill and technology training promote strong labor market attachments, enhanced productivity and profitability. Economic benefits differ for individuals, businesses, and governments. Individual returns come in the form of overall quality of life to include enhanced earnings. Businesses experience increased revenues, and governments see reduced spending on services and receive increased work life tax revenues. Graduates from high school, technology centers, certification programs, community colleges and four year institutions earn more income and increase their overall standard of living.

Benefits of Increased Educational Levels

Public Economic Benefits

- Increased Tax Revenues
- Greater Productivity
- Increased Consumption
- Increased Workforce Flexibility
- Decreased Reliance on Government Financial Support

Private Economic Benefits

- Higher Salaries and Benefits
- Enhanced Employment Opportunities and Stability
- Higher Savings Levels
- Improved Working Conditions
- Personal/Professional Mobility

Public Social Benefits

- Reduced Crime Rates
- Increased Charitable Giving/Community Service
- Increased Quality of Civic Life
- Social Cohesion/Appreciation of Diversity
- Improved Ability to Adapt to and Use Technology

Private Social Benefits

- Improved Health/Life Expectancy
- Improved Quality of Life for Offspring
- Better Consumer Decision-Making
- Increased Personal Status
- More Hobbies, Leisure Activities

Economic Impact Studies of Secondary Education and Two-Year Colleges

Economic impact studies of educational institutions, their activities, and their programs are undertaken to attempt to measure the effect of the institution on a regional or local economy. Occasionally educational institutions are examined with a state economy in mind—for example, *An Economic Analysis of Higher Education in Tennessee* (SBBER, 2000). There are few economic impact studies of a particular course or area of study like the current analysis.

Economic impact studies began to appear more frequently throughout the 1980s as the demand for accountability and quantification in education grew. In the 1990s and continuing today, economic impact studies of post-secondary education proliferated. However, in spite of the important contribution of secondary education's career and technical programs, economic impact studies of this area have not been forthcoming. In addition, the absence of income data on secondary and post-secondary graduates in the economic impact equation may result in an uneven portrait of the importance of career and technical education on local communities. Although, the ability to use unemployment insurance wage data matching in labor market research has been utilized for the past two decades, this has not been the case in education research. In the current study both of these shortcomings in previous research will be addressed. The economic impact of secondary career and technical education will be included in the analysis as well as utilizing wage data on graduates to examine the effect of their earnings.

Economic Impact Analysis for the Current Study

To accomplish an economic analysis of the impact of career and technical education in Tennessee, the most recent year of comparable annual data for program completers and graduates and institutional/program budgets and employment were required. For graduates and program completers, the information generated from this analysis included employment and earnings, turnover effect, return on investment and taxes produced by concentration completers and

graduates from secondary school programs, technology centers, and community college career and technical programs.

The various economic impacts of the secondary and post-secondary career and technical education system were calculated using a well established input /output model known as IMPLAN®. The brief note on the model's development with a description and explanation of its principal outputs follows.

IMPLAN® model outputs include multipliers by NAICS (North American Industrial Classification System—a classification scheme for summarizing economic data by business sector) sectors, calculated indirect and induced effects of direct expenditures for the economic entity being modeled (in this case the secondary and post-secondary career and technical education system in Tennessee), employment effects of the economic entity, aggregate dollar output effect of direct expenditures with that entity in its business sector, estimated employee compensation associated with that level of output, estimated proprietary income generated from those same direct expenditure levels, estimated other property income associated with the output level of the economic entity, indirect business taxes and a total taxes summary associated with the output level of the economic entity being modeled. The interpretation of each of the above model outputs follows below.

Direct, Indirect, and Induced Effects Defined. In the process of modeling the economic impact of expenditures with a business entity, input/output models measure four economic impacts, which are:

- Direct Effect
- Indirect Effect
- Induced Effect
- Total Effect

Findings: The Economic Impact of Secondary and Post-Secondary Career and Technical Education Expenditures

For institutions and programs, institutional operating expenses and employment information generated from this analysis includes turnover effect, return on investment and taxes generated by the Workforce Investment Act, secondary school programs, technology centers, and community college career and technical programs. The Workforce Investment Act had a total output impact of $96,758,540. The WIA also produced a total labor income impact of $43,834,559, and a total tax impact of $9,013,124. In addition, the WIA was shown to have created or had an impact on just over 1,309 jobs.

Tennessee secondary career and technical education was shown to have a total output impact of $52,851,513. The total labor income impact was shown to total $23,943,341, while the total tax impact totaled $4,923,155. Also, CTE created or had an impact on over 715 jobs.

The Tennessee Technology Centers had a total output impact of $390,853,369. The total labor income and total tax impacts were substantial as well, coming in at $176,761,775 and $36,468,796 respectively. The Tennessee and Technology Centers also created or had an impact on just over 5,280 jobs.

Tennessee's Career and Technical Community College spending had a total output impact of $125,098,582. The total labor income impact was $56,673,457, and the total tax impact was $11,653,018. The TCT Community Colleges also created or had an impact on over 1,692 jobs.

Combining the four programs, we find a total output impact of $658,816,116. The labor income and tax impacts come out to $302,976,467 and $62,024,420 respectively, for a total economic impact of $1,023,817,003. Secondary and post-secondary career and technical education in Tennessee had a cost-benefit ratio of 1:1.99, generating nearly double the benefits relative to the costs of operations. Also, the total number of jobs created or impacted by the four programs was just over 9,025.

Findings: Occupational Employment and the Economic Impact of Secondary and Post-Secondary Graduate or Completer Earnings

Program completion and graduate information was matched against Tennessee unemployment insurance records for the quarters after graduation or program completion to show industry employment and earnings. Current earnings and taxes generated are presented.

Career Center Clients

Nearly 7,900 Career Center clients had total earnings of $117.5 million dollars for 2001/2002, with median earnings of $13,482 and average earnings of $15,059. Most WIA clients (42.8 percent) were employed in the Service sector. In the Wholesale/Retail Trade sectors, where the earnings were the lowest among the 10 sectors, the percentage of employed WIA clients was 24.3 percent. Manufacturing, Finance, Insurance, and Real Estate and Transportation, Communication and Public Utilities accounted for 25.7 percent of WIA client employment and included sectors with the highest earnings. The Workforce Investment Act Career Center client earnings had a total output impact of $172,928,909. WIA Career Center client earnings also produced a total labor income impact of $46,759,825 and a total tax impact of $15,582,011. In addition, WIA Career Center client earnings were shown to have created or had an impact on 1446 jobs.

Secondary Career and Technical Education Program Graduates and Completers

Slightly over 13,000 secondary career and technical education graduates/completers had earnings of $99.8 million dollars for 2001/2002, with median earnings of $6,409 and average earnings of $7,655 for the group. Approximately one-half of the graduates/completers were expected to be employed only part time since they were participating in advanced training, apprenticeship programs or post-secondary education. Most (77.9 percent) were employed in

the Wholesale/Retail Trade and Services sectors where the earnings were the lowest among the 10 sectors. Manufacturing and Construction accounted for 13.7 percent of the employment and accounted for the highest earnings.

Tennessee secondary career and technical education graduate/completer earnings were shown to have a total output impact of $146,896,131. The total labor income impact was shown to total $39,720,582, while the tax impact totaled $13,236,289. Also, secondary CTE created or had an impact on over 1228 jobs.

Tennessee Technology Center Graduates

Over 11,000 post-secondary Technology Center graduates for 2001/2002 generated nearly $263 million dollars in total earnings, with median earnings of $21,081 and mean earnings of $22,918. Most Technology graduates were employed in the Services sector at a rate 7 percent higher than secondary graduates and with three times the median, average, and total earnings. One-third of the graduates were employed in manufacturing at the highest median, mean, and total wage and at a rate three times higher than either post-secondary or Community College or Technical Institute graduates.

The percentage of post-secondary graduates employed in Wholesale/Retail Trade was 33 percent lower than secondary graduates with average earnings three times higher. In every sector, Technology Center graduate average earnings ranged from nearly two times to over four times higher than the average earnings reported for secondary graduates/completers and both sector employment and earnings were comparable to Community College and Technical Institute graduates. The most striking contrast among the groups was in the Manufacturing sector where employment for Technology Center graduates was significantly higher than for other groups—suggesting that a Technology Center education contributes substantially to employment in the high wage manufacturing sector in Tennessee.

Tennessee Technology Center graduate earnings had a total output impact of $386,957,867. The total labor income and total tax impacts were substantial as well, coming in at $104,633,057 and $34,867,399, respectively. The

Technology Center graduate/completer earnings also created or had an impact on just over 3,235 jobs.

Community College and Technical Institute Career and Technical Education Program Graduates

Nearly 4,000 Community College and Technical Institute career and technical education graduates for 2001/2002 generated $98.4 million dollars in total earnings, with median earnings of $23,559 and mean earnings of $24,742. With 3,979 post-secondary graduates generating nearly the same total earnings as 13,038 secondary graduates, the impact of continued education is clearly demonstrated. More importantly, both median and mean earnings were over 3 times higher among post-secondary graduates. Most post-secondary graduates were employed in the Services sector at a rate 1.8 times higher than secondary graduates with double the total earnings and with 36 percent higher average income. With the percentage of post-secondary graduates employed in Wholesale/Retail Trade 33 percent lower than secondary graduates, average earnings were more than doubled. In every sector, post-secondary, average earnings ranged from nearly two times to over four times higher than the average earnings reported for secondary graduates/completers.

Tennessee's Community College/Technical Institute graduate earnings had a total output impact of $144,885,102. The total labor income impact was $39,176,802, and the total tax impact was $13,055,083. The Community College/Technical Institute graduate earnings also created or had an impact on over 1,211 jobs.

Combining the four programs, we find a total output impact of $851,668,009. The labor income and tax impacts come out to $230,290,266 and $76,740,782 respectively, for a total economic impact of over $1.1 billion. Secondary and post-secondary career and technical education in Tennessee produced a turnover ratio of 1:1.01. For every dollar earned by secondary and post-secondary career and technical education clients, graduates and completers an additional $1.01 was generated for the state economy. Also, the total number of jobs created or impacted by the four programs was just over 7,000.

The cost-benefit ratio produced by secondary and post-secondary expenditures and earnings was 1:5.37. For every $1.00 expended on secondary and post-secondary education $5.37 is returned to the state economy in direct earnings as well as through indirect and induced employment and industry outputs, additional labor income and taxes. Total employment created or impacted by those expenditures and earnings included over 16,000 jobs.

Summary

The purpose of this project was to examine the economic impact of secondary and post-secondary career and technical education on the individual and on the economy of the state of Tennessee. This study was designed to provide simple and straightforward answers to a common set of questions frequently asked by policymakers: How many people get jobs, what are the jobs, how much do they get paid, how important are these results to the state, and what is the public's return on their investment.

This study:

- Examined the relative value of career and technical education to the individual and to the state economy.
- Matched and tracked secondary and post-secondary career, vocational and technical completers from secondary schools, technology centers, community colleges and state career centers in Tennessee in the 2001-2002 academic year through Tennessee unemployment insurance records to show industry employment and earnings.
- Explored the relative value to the individual and to the state of secondary and post-secondary career and technical education articulation and dual enrollment.
- Conducted an economic impact analysis of career and technical education outcomes for the state of Tennessee.
- Examined the return on investment in career and technical education for Tennessee.

Research Questions

1. How many program clients, completers and graduates from career centers, secondary school programs, technology centers, and community college/technical institute career and technical programs were employed in Tennessee in the quarters after graduation?

Over 36,000 career and technical education graduates and completers from Tennessee secondary and post-secondary institutions and programs were employed in the year following graduation or program completion. Educational expenditures and graduate earnings created or expanded another 16,000 jobs. Nearly 7,900 Career Center clients were employed, for 2001/2002. Slightly over 13,000 secondary career and technical education graduates/completers had earnings. Over 11,000 post-secondary Technology Center graduates were employed and Community College and Technical Institute career and technical education graduates filled nearly 4,000 jobs.

2. What is the economic impact of dual enrollment and articulation on the individual and the state?

In our simulation model, Tennessee high schools' full Average Daily Attendance (ADA) funding would remain at approximately $7,366 for students taking less than half their coursework in a post-secondary institution during the junior year. In the senior year, students would take more than half their coursework in a post-secondary institution and ADA would drop to half, or $3,683. As seen in the model, if 10 courses, or one-half of a 20 course Associate's degree, are completed during the junior and senior year, the student avoids one full year of college tuition.

The most notable number in the funding model is Tennessee's approximate savings per dual enrollment student of $3,683. These savings are available because dual enrollment students may cut up to one year from time to associate's degree if they begin earning post-secondary credit during high school. In order for the savings to have an impact though, Tennessee must work to define

dual enrollment policy and provide proper funding in order to make dual enrollment opportunities available to Tennessee high school students.

Less time in college means fewer costs in tuition, fees, room and board, and supplies for students and families. In addition, it also means that individual earnings begin one year earlier. Nationally, an individual with an Associate's degree has an average income of $35,000. This acceleration benefits both the individual and the state economy.

3. What are the earnings of program completers and graduates from secondary school programs, technology centers, and community college career and technical programs that were employed in Tennessee in the quarters after graduation?

Career Center clients for 2001/2002 had total earnings of $117.5 million dollars for 2001/2002, with median earnings of $13,482 and average earnings of $15,059. Secondary career and technical education graduates/completers had earnings of $99.8 million dollars, with median earnings of $6,409 and average earnings of $7,655 for the group. The relative low earnings level resulted from the approximately one-half who would be expected to be employed only part time since they were participating in advanced training, apprenticeship programs or post-secondary education.

Technology Center graduates for 2001/2002 generated nearly $263 million dollars in total earnings, with median earnings of $21,081 and mean earnings of $22,918. Community College and Technical Institute career and technical education graduates for 2001/2002 generated $98.4 million dollars in total earnings, with median earnings of $23,559 and mean earnings of $24,742.

4. In what industries are graduates employed?

Most WIA clients (42.8 percent) were employed in the Service sector. In the Wholesale/Retail Trade sectors, where the earnings were the lowest among the 10 sectors, the percentage of employed WIA clients (24.3 percent) was less than half that of secondary graduates. Manufacturing, Finance, Insurance, and

Real Estate and Transportation, Communication and Public Utilities accounted for 25.7 percent of WIA client employment and included sectors with the highest earnings. Mining, with the highest average earnings employed 9 people.

Most secondary career and technical education graduates/completers for 2001/2002 (77.9 percent) were employed in the Wholesale/Retail Trade and Services sectors where the earnings were the lowest among the 10 sectors. Manufacturing and Construction accounted for 13.7 percent of the employment and accounted for the highest earnings.

Most Technology Center graduates were employed in the Services sector at a rate of 36.1 percent. One-third of the graduates were employed in Manufacturing at the highest median, mean, and total wage suggesting that a Technology Center education contributes substantially to employment in the high wage Manufacturing sector in Tennessee.

Most Community College/Technical Institute CTE graduates (53.4 percent) were employed in the higher wage Services sector, with the 15.9 percent employed in Wholesale/Retail Trade, 9.8 percent in Public Administration, and 8.9 percent in Manufacturing.

5. What is the economic impact of their earnings?

The Workforce Investment Act Career Center client earnings had a total output impact of $172,928,909. WIA Career Center client earnings also produced a total labor income impact of $46,759,825 and a total tax impact of $15,582,011. In addition, WIA Career Center client earnings were shown to have created or had an impact on 1446 jobs.

Tennessee secondary career and technical education graduate/completer earnings were shown to have a total output impact of $146,896,131. The total labor income impact was shown to total $39,720,582, while the total tax impact totaled $13,236,289. Also, secondary CTE graduate/completer earnings created or had an impact on 1,228.33 jobs.

Tennessee Technology Center graduates had a total output impact of $386,957,867. The total labor income and total tax impacts were substantial as well, coming in at $104,633,057 and $34,867,399 respectively. Tennessee

Technology Center graduate earnings also created or had an impact on 3,235.7 jobs.

Tennessee's Community College and Technical Institute graduate earnings had a total output impact of $144,885,102. The total labor income impact was $39,176,802, and the total tax impact was $13,055,083. The Community College and Technical Institute graduates also created or had an impact on 1,211.51 jobs.

Combining the four areas, we find a total output impact of $851,668,009. The labor income and tax impacts come out to $230,290,266 and $76,740,782 respectively, for a total economic impact of over $1.1 billion. Secondary and post-secondary career and technical education in Tennessee produced a turnover ratio of 1:1.01. For every dollar earned by secondary and post-secondary career and technical education clients, graduates and completers an additional $1.01 was generated for the state economy. Also, the total number of jobs created or impacted by the four programs was just over 7,000.

6. What is the economic impact of institutional operating expenses and employment in secondary and post-secondary career and technical education programs in schools, technology centers, and community college career and technical programs?

The Workforce Investment Act had a total output impact of $96,758,540. The WIA also produced a total labor income impact of $43,834,559, and a total tax impact of $9,013,124. In addition, the WIA was shown to have created or had an impact on just over 1,309 jobs.

Tennessee secondary career and technical education was shown to have a total output impact of $52,851,513. The total labor income impact was shown to total $23,943,341, while the total tax impact totaled $4,923,155. Also, CTE created or had an impact on over 715 jobs.

The Tennessee Technology Centers had a total output impact of $390,853,369. The total labor income and total tax impacts were substantial as well, coming in at $176,761,775 and $36,468,796 respectively. The Tennessee and Technology Centers also created or had an impact on just over 5,280 jobs.

Tennessee's Career and Technical Community College spending had a total output impact of $125,098,582. The total labor income impact was $56,673,457, and the total tax impact was $11,653,018. The TCT Community Colleges also created or had an impact on over 1,692 jobs.

Combining the four areas, we find a total output impact of $658,816,116. The labor income and tax impacts come out to $302,976,467 and $62,024,420 respectively, for a total economic impact of slightly over $1.0 billion. Secondary and post-secondary career and technical education in Tennessee had a cost-benefit ratio of 1:1.99, generating nearly double the benefits relative to the costs of operations. Also, the total number of jobs created or impacted by the four programs was just over 9,025.

7. What is the return on investment in secondary and post -secondary career and technical education programs in career centers, schools, technology centers, and community college career and technical programs?

Secondary and post-secondary career and technical education expenditures in Tennessee had a cost-benefit ratio of 1:1.99, generating nearly double the benefits relative to the costs of operations. Secondary and post-secondary career and technical education earnings in Tennessee produced a turnover ratio of 1:1.01. For every dollar earned by secondary and post-secondary career and technical education clients, graduates and completers an additional $1.01 was generated for the state economy. The cost-benefit ratio produced by combining secondary and post-secondary expenditures and earnings was 1:5.37. For every $1.00 expended on secondary and post-secondary education $5.37 is returned to the state economy in direct earnings as well as through indirect and induced employment and industry outputs, additional labor income and taxes.